

## REMARKS

Claims 1-11 and 13-14 are pending in the application.

New claims 13-14 have been added to the application in this amendment. No new matter has been added to the application by way of these claim amendments.

### I. THE CLAIMED INVENTION

By way of summary, the present invention utilises relative motion between an object within a scene and a plurality of linear array detectors in order to detect objects passing through the scene and to determine direction and speed of movement of said objects. Specifically, the object to be detected passes successively through the field of view of each of the plurality of linear arrays. The direction of movement of the object is easily determined by looking at the order in which it passes the linear arrays. (*See* PCT specification, page 2, lines 15 - 17 refer). The speed of motion of the object is determined by the time difference between the object crossing the field of view of the linear arrays. (*See* specification description page 2, lines 17 - 19). Changes in size of the perceived object can be used as an indication of movement towards or away from the detectors and hence a determination of true motion can be made. (*See* specification, page 2, lines 24 - 25 refer). Without limitation, the plurality of linear arrays are static.

The use of linear arrays provides an advantage in terms of improved signal / noise ratio over two-dimensional arrays. (*See* figure 2 and the accompanying text in the last paragraph on page 5 of the PCT specification). Specifically, the configuration of the linear array provides space next to each detector element for amplifying and filtering electronics to improve the signal to noise ratio. In contrast, amplifying and filtering can only be applied to the signal from a two dimensional array of detector elements after multiplexing due to the close packing of detector elements therein. This gives a reduced signal to noise ratio because the minimum noise bandwidth of the multiplexed signal is the product of the frame rate and the number of pixels in a column (*See* third paragraph on page 3 and the last paragraph on page 5 of the specification). The use of linear arrays provides additional advantages of reduced power consumption and wide area of coverage in comparison with high resolution two-dimensional imagers. Reduced power

consumption is beneficial for sustained operation of distributed sensor networks. (See second paragraph on page 7 of the specification).

## **II. THE OBVIOUSNESS REJECTION TRAVERSE**

The examiner rejected claims 1-3 and 5-8 for being unpatentable over Kawaziri (USP 5,929,784) in view of Vock et al (USP 5,789,519). The examiner further rejected claims 4 and 9-11 over the same two references and further in view of Salmon (USP 6,900,756) (Claim 4); Hirzel et al (USP 4,671,650)(Claim 9); Zhdanov (USP 6,633,256)(Claim 10); and Martin (USP 6,243,131)(Claim 11). The examiner rejected independent claim 1 over Kawaziri in view of Vock on the basis that Kawaziri discloses all of the claim 1 features except for a system that includes a signal processor for detecting images received by the plurality of areas of interest in a scene. The examiner relies upon Vock et al for disclosing this teaching. In particular, the examiner relies upon Vock et al for disclosing a camera with a plurality of detector element forming an array and a processor that is used to determine the direction and speed of a golf ball. The examiner justifies the combination of references on the basis that Vock et al is analogous prior art and because one skilled in the art at the time of the invention would have incorporated the Vock et al speed and direction calculation into the Kawasiri image processing system to provide an object detection system that both recognizes and object and that tracks the speed and direction of the object.

The examiner's obviousness rejections are traversed for a variety of reasons. Firstly, the examiner has not made out a *prima facie* case of obviousness. Secondly, the Kawaziri reference is not analogous the to claimed invention and is, therefore, not a reference that one skilled in the art would have consulted in reaching the claimed invention. Thirdly, the Kawaziri reference and the Vock et al references are not properly combinable.

### **A. There Is No *Prima Facie* Case Of Obviousness**

All pending claims 1-11 are patentable over the prior art of record because the Examiner has not made out a *prima facie* case of obviousness of the rejected claims. During patent examination, the PTO bears the initial burden of presenting a *prima facie* case of unpatentability. *In re Oetiker*, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992); *In re Piasecki*, 223 USPQ 785, 788 (Fed. Cir. 1984). If the PTO fails to meet this burden, then the applicant is entitled to the patent. *See In*

*re Glaug*, 62 USPQ2d 1151 (Fed. Cir. 2002). Specifically, the examiner has not demonstrated nor attempted to demonstrate that the prior art discloses the claim 1 elements of (1) ". . . an image store for receiving signals from the linear array when a detected object passes through the scene . . ."; or (2) "...signals from the linear array are received by an image store when a detected object passes through the scene"; or (3) that linear arrays "... image a plurality of areas of interest in a scene". Any one of these missing features is sufficient alone to render independent claim 1 and dependent claims 2-11 non-obvious and patentable.

Claim 1 includes the requirement that the apparatus include "... an image store for receiving signals from the linear array when a detected object passes through the scene . . .". The cited prior art does not disclose detecting objects as they pass through "the scene". The examiner cites to Kawaziri for supplying this teaching. Although Kawaziri relates to monitoring objects (vehicles) in a scene, it is concerned with measuring the distance between a leading vehicle and a trailing vehicle. In Kawaziri, measurements of the distance between the vehicles are made from said trailing vehicle, typically whilst both vehicles are in motion. There is no teaching in Kawaziri to monitoring objects passing through the scene. Indeed, Kawaziri does not even measure the lateral displacement or motion of the leading vehicle. For at least this reason, independent claim 1 and all claims dependent thereupon are non-obvious and patentable.

The examiner has also not made out a *prima facie* case of obviousness with respect to claim 1 because neither cited reference teaches "...signals from the linear array are received by an image store when a detected object passes through the scene". The examiner relies upon Kawaziri for supplying this teaching. However, in Kawaziri, signals from the linear array are received substantially continuously by the image store whilst objects remain within the measurement zone(s). For at least this reason, independent claim 1 and all claims dependent thereupon are non-obvious and patentable.

There is also no *prima facie* case of obviousness because the cited prior art fails to teach the feature of claim 1 wherein the linear arrays "... image a plurality of areas of interest in a scene". By way of explanation, in Kawaziri – which the examiner relies upon for this claim feature - sub-arrays (a, b, c) within each array 3, 4 do image a plurality of areas of interest in the scene. However, paired sensor arrays 3a and 4a, 3b and 4b, and 3c and 4c are spaced apart in parallel along the direction of their longitudinal axes so that they have the same field of view

(column 4, lines 59 – 62). Hence, when determining distance measurements, the arrays 3, 4 image the same area of interest in the scene. Thus, claim 1 and all claims dependent thereupon are non-obvious and patentable.

**B. Kawaziri Is Non-Analogous Art And May Not Be Considered**

Kawaziri is non-analogous prior art that the examiner is prohibited from employing in an obviousness analysis in this application. Only art that is analogous to a claimed invention may be employed in an obviousness determination. *In re Clay*, 966 F.2d 656, 658 (Fed. Cir. 1992). Prior art is not analogous if (1) the art is not from the same field of endeavor as the claimed invention – regardless of the problem addressed; and (2) the prior art reference from another field of endeavor is not pertinent to the particular problem faced by the inventor. *In re Deminski*, 796 F.2d 436, 442 (Fed. Cir. 1986). The test for non-analogous art is met by Kawaziri.

**1. Kawaziri is not in the same field of endeavor**

Much of the teaching in Kawaziri relates to improving the measurement of distance between the vehicles using lines drawn on the road which define a traffic lane. Hence, much of the teaching in Kawaziri is restricted to monitoring objects (vehicles) on a traffic lane and not in the general environment, e.g. off-road applications. Accordingly, the skilled person seeking to provide a general image processing system for monitoring objects passing through a scene would not consider Kawaziri to contain any relevant teaching. Indeed, the constraint of having to monitor objects moving between white lines painted on the road is likely to encourage the skilled person to ignore the teaching in Kawaziri as unsuitably restrictive.

**2. Kawaziri is not reasonably pertinent to the problems faced by the inventor**

A prior art reference that is not in the same field of endeavor is conclusively non-analogous if the purposes and uses of the invention and the prior art devices are different. *See In re Clay*, 966 F.2d at 659-60. A reference is not pertinent if, because of the matter with which the reference deals, it would not have logically commended itself to the inventor's attention.

As indicated above, the present invention is directed to detecting objects passing through the scene and to determine direction and speed of movement of said objects. The examiner all but admits that Kawaziri does not involve detecting an object as it passes through a scene and determining the direction and speed of its movement when the examiner relies upon Volk et al for disclosing most of the measurement aspects of the claimed invention. That Kawaziri is not

helpful in solving the problem faced by the inventors becomes quite apparent when considering Kawaziri's measurement method. In Kawaziri, array pairs 3a, 4a, etc image substantially the same area of interest in the scene simultaneously, whereas the present invention operates by imaging a plurality of areas of interest in the scene consecutively to provide time phased images from the plurality of imagers. Hence, Kawaziri appears to teach away from the present invention in this respect.

The Applicant has demonstrated that Kawaziri is prior art that is in a field of endeavor that is not analogous to the claimed invention. Therefore, the examiner is not allowed to rely upon Kawaziri and the obviousness rejection of claims 1-11 must be withdrawn.

### **C. Kawaziri and Vock et al. Are Not Properly Combined**

The combination of Kawaziri and Vock et al would not be made by one of ordinary skill in the art at the time of the invention. Kawaziri and Vock et al use completely different imaging means which makes them incompatible in the eyes of one skilled in the art. Specifically, Kawaziri employs linear imaging arrays to measure the separation between two vehicles. Vock et al on the other hand relies on a conventional two-dimensional imager or a mechanically scanned linear array in order to measure direction and speed of movement of an object (a golf ball).

Mindful that Kawaziri only teaches a linear array, the skilled person would not be motivated to combine Vock's speed and direction calculation into the Kawaziri image processing system with any expectation of achieving any technical effect, let alone the advantageous effect of the present invention. Indeed, the Applicant submits that the method taught in Vock for calculating speed and direction is not compatible with the images from the linear arrays taught in Kawaziri. In view of the benefits mentioned above of using a linear array in the present invention (reduced power consumption and wide area of coverage), we would submit that it would be counter-intuitive for the skilled person seeking to provide the technical effect of the present invention to incorporate Vock's speed and direction calculation into the Kawaziri image processing system as this would require replacement of the beneficial static linear arrays of Kawaziri with either a two-dimensional imaging array or a scanned linear array as taught in Vock et al. For this reason as well, claims 1-11 are non-obvious and patentable.

#### **D. Several Dependent Claims Are Independently Patentable**

Claims 5 is non-obvious over the cited prior art at least because there is no teaching in Vock et al at column 10, lines 29 - 39 - as the examiner alleges - to the feature wherein "each detector element in each linear array has associated therewith an independent noise limiting means". We would request Examiner to specifically identify said teaching in Vock et al or in the alternative allow claim 5.

Similarly, there is no support in Vock et al for Examiner's assertion regarding claim 6. By way of explanation, Vock et al at column 17, lines 31 - 35 merely teaches a buffer amplifier. There is no teaching to "an independent amplifier at each detector element". Similarly, Vock et al at column 18, lines 22 - 23 merely teaches "applying a digital temporal high pass filter to each individual pixel; in effect there is one FIR to each pixel." By way of explanation, there is only one FIR filter 362 which is applied to the digital output from the camera assembly 344 and the A/D converter 346 (figure 12 refers).

#### **III. NEW CLAIMS 13-14**

New claims 13-14 are added to the application and are believed to define patentable subject matter. In particular, claim 13 requires images to be imaged consecutively. This claim feature is not found in Kawaziri. Instead, Kawaziri teaches that objects in the scene are imaged substantially simultaneously onto sensor arrays 3a, 3b, 3c and 4a, 4b, 4c to form image signals 30a, 30b, 30c and 40a, 40b, 40c (column 4, line 62 - column 5, line 1).

#### **CONCLUSION**

All pending application claims are believed to be patentable for the reasons recited above. Favorable reconsideration and allowance of all pending application claims is, therefore, courteously solicited.

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